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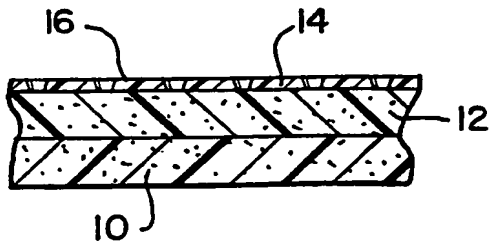
(54) Title: INTEGRAL FOOD TRAY

(57) Abstract

The present invention is directed to a receptacle (16) for containing food products which tend to exude liquids, which includes a structural support layer (10) and a liquid absorbing layer (12) laminated to the support layer (10). The present invention is also directed to a method for producing a receptacle (16) for containing food products which tend to exude liquids, and to a method for absorbing fluid exuded from a food product by placing the food product within the food receptacle (16) of the invention.



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INTEGRAL FOOD TRAY

FIELD OF THE INVENTION

The present invention is directed to a tray intended for packaging and displaying poultry, fish, meat, and other foods which tend to exude fluids after packaging. More particularly, the invention is directed to a tray or other container including a moisture absorbing food contact layer and a second layer for providing structural integrity and a moisture barrier. The present invention is also directed to methods for making and using such a tray.

BACKGROUND OF THE INVENTION

Conventionally, foods such as fresh poultry, fish, meat, and other foods which tend to exude fluids after packaging, are packaged for refrigerated display by employing a tray to receive the food. Generally, a transparent or translucent plastic film is wrapped and sealed around the food placed on the tray itself and the tray to provide a finished, sealed package. The tray provides structural integrity and acts as a reservoir for fluids. Ideally, the tray also serves as a moisture barrier.

One type of tray is generally constructed from compressed wood pulp. However, the structural integrity of this type of tray is diminished by the absorption of fluids from the product placed on the tray. Another type of tray is made from a non-absorbent material which can retain its structural integrity upon exposure to fluids and moisture. Suitable non-absorbent materials include thermoplastic materials, such as polyethylene, polypropylene, polystyrene, and polyvinyl chloride. Although trays made from thermoplastic

materials as described above have several advantages in terms of cost, weight, aesthetics, durability, and other characteristics, the inability of these materials to absorb moisture often results in the accumulation of fluid exuded from the food product placed on the tray. The tray with the food product is customarily wrapped and optionally heat sealed with a transparent, flexible thermoplastic film so that the finished product may be displayed in a refrigerated display case in such a manner that the consumer may view the food product directly through the packaging. Accordingly, the accumulation of fluids in the tray surrounding the food product is undesirable because it results in an unsightly, unappetizing and therefore unappealing packaged product. Furthermore, and more importantly, although the package is sealed with a flexible transparent film the accumulated fluid may leak from the package. In addition, accumulated fluids may promote the growth of bacteria.

One approach to solving this problem has been to provide an absorbent pad between the upper surface of the non-absorbent tray and the food product. In theory, the pad will absorb the fluids exuded from the food product preventing the accumulation of free fluids within the package. Another proposed solution to the problem has been to provide a separate reservoir within the tray such that fluids exuded by the food product are drained away from contact with the product, generally by providing a retaining surface above the bottom wall of the tray. The retaining surface includes drain holes extending therethrough such that fluid drains from the product retaining surface and is retained above the lower wall of the tray. Examples of food trays are shown in U.S. Patents 3,575,287, 4,275,811, 4,321,997, 4,410,578, 4,929,480 and 4,949,897. The disclosure of each of the foregoing U.S. patents is hereby incorporated by reference.

The use of absorbent pads for the absorption of fluids from the food product suffers from the disadvantage that the two component food tray must be assembled before the food is placed in the tray, resulting in increased labor costs. Further, after the pad is saturated with moisture it tends to stick to the food product and must be physically separated from the food product by the consumer after the package is opened. Because the pad is saturated with fluids exuded by the food product, this is a generally unappealing exercise.

The use of a separate fluid reservoir to separate and retain exuded fluids suffers from other disadvantages. The construction of the food tray is complex, requiring at least two layers separated by a free space to serve as the reservoir. Further, it is difficult to keep the fluid within the reservoir when the package is upset from a level orientation.

Thus, it is an object of the present invention to provide a food product tray which is capable of absorbing fluid exuded from a food product placed within the tray, yet does not require either the use of a separate pad or a complex separate fluid reservoir. It is yet another object of the present invention to provide a food tray which is inexpensive, easy to manufacture, and requires no extra labor in packaging or unwrapping the food product.

SUMMARY OF THE INVENTION

In a first aspect, the present invention is directed to a receptacle for containing food products which tend to exude liquids. The receptacle includes a laminate which consists of a structural support layer and a liquid absorbing layer laminated to the support layer. The laminate may be formed into any suitable shape to form a receptacle for food.

In another aspect, the present invention is directed to a method for producing a receptacle for containing food products which tend to exude liquids, comprising the steps of

providing a structural support layer with a top surface and a bottom surface, where the structural support layer is made from a thermoplastic material, providing an absorbing layer with a top surface and a bottom surface, and attaching the bottom surface of the absorbing layer to the top surface of the structural support layer to form a laminate.

In a third aspect, the invention is directed to a method for absorbing fluid exuded from a food product placed within a food receptacle, comprising the steps of providing a food receptacle which includes a structural support layer made of a thermoplastic material having a top surface and a bottom surface, and a liquid absorbing layer with a top surface and a bottom surface, where the bottom surface of the liquid absorbing layer is laminated to the top surface of the support layer, and placing a food product which tends to exude liquids above the top surface of said absorbing layer.

BRIEF DESCRIPTION OF THE FIGURES

FIG. 1 is a cross-sectional view of one embodiment of a laminate of the present invention.

FIG. 2 is a cross-sectional view of a second embodiment of a laminate of the present invention.

FIG. 3 is a cross-sectional view of a food tray constructed from the laminate of the present invention.

FIG. 4 is a cross-sectional view of a third embodiment of the present invention.

FIG. 5 is a enlarged, cross-sectional view of a perforated cover sheet.

DETAILED DESCRIPTION OF THE INVENTION

All patents, patent applications, and publications referred to herein are incorporated by reference in their entirety. In case of a conflict in terminology, the present disclosure controls.

The present invention relates to a receptacle or food tray constructed from a laminate material including at least two layers. With reference to Fig. 1, a cross-sectional view of a preferred laminate according to the present invention is shown. Fluid absorbing layer 12 rests upon structural layer 10. A wicking layer 14 is applied to the upper surface of fluid absorbing layer 12.

Structural layer 10 serves to form and maintain the desired shape of the tray, provide structural integrity and support for the food product provided on the tray and provide a moisture barrier to prevent fluid from leaking or penetrating in or out of the tray. Layer 10 may be made from any suitable thermoplastic material such as polyethylene, polypropylene, PAPER, polystyrene, or polyvinyl chloride cellular materials. Layer 10 is preferably made from polystyrene foam obtained from either expanded polystyrene or sheet molding.

Fluid absorbing layer 12 rests upon the upper surface of layer 10. Layer 12 may be constructed of a flexible polyurethane foam, natural or synthetic hydrophilic open-cell cellular materials (such as natural rubber foam treated with a wetting agent or foams made from acrylics or ethylene vinyl acetate). Although absorbing layer 12 will generally be somewhat compressible and will compress where the food product is placed upon it, the layer must nonetheless be capable of absorbing fluid exuded from the food product placed on the tray. In addition, absorbing layer 12 must be compatible with structural layer 10 such that the two layers may be laminated. If desired, the lamination surface of either layer 10 or 12 may

be treated to enhance lamination, by for example flame treatment or corona discharge treatment. If a more rigid foam is employed as the absorbing layer 12, then the structural layer 10 need not provide as much support.

The absorbing layer may optionally include a super absorbent polymer (SAP) material, and/or a biocide material. "SAP" refers to one or more hydrocolloid materials capable of absorbing many times their own weight of aqueous fluid. These materials are generally water soluble or water swellable polymers, prepared by polymerization of suitable monomers, leading to the formation of homopolymers, or copolymers. The polymers are typically reacted with a crosslinking agents during and/or after polymerization to form crosslinked polymers, which confers a degree of water insolubility to otherwise water soluble polymers, while retaining susceptibility of the polymer to swelling in water and water-containing fluids. Typically, the superabsorbent polymers are salts of poly (acrylic acid) or acrylic acid copolymers. Additional superabsorbents include hydrophilic polymer grafts onto starch or cellulose backbones, crosslinked carboxylated celluloses, and the salts of maleic anhydride copolymers.

Absorbing layer 12 is preferably a polyurethane foam made by in-situ polymerization. Polyether or polyester polyols of functionality 2-7 and having a molecular weight range of between 500 - 7000, are mixed with silicone surfactants and water as well as catalysts. An example of a suitable polyether polyol is PolyG8334 available from Olin Chemicals. An example of a suitable polyester polyol is Fomrez 50 available from Witco Chemicals. A suitable silicone surfactant is Dabco 5043 from Air Products and a suitable catalyst is Dabco 33-LV, also from Air Products. The polyol mixture is then reacted with a polyisocyanate such as diisocyanatophenyl methane (MDI) or toluene diisocyanate (TDI)

employing a mixer at between 1000 and 5000 rpm. The resultant polyurethane foam may then be cast to form sheet material. The polyurethane foam thus formed may be cast alone or onto preformed structural layer 10, thereby directly laminating the absorbing layer 12 onto structural layer 10.

Absorbing layer 12 may include from 0 to 10 % by weight SAP and/or from 0 to 1 % by weight of a biocide. It is preferred that layer 12 have a thickness suitable for commercial application, e.g., from about 1/16" to 1/4". The absorbing layer will preferably absorb water in an amount of from about 10 to 30 times the weight of the layer.

Finally, absorbing layer 12 may optionally be covered with food contact membrane 14. Membrane 14 serves to wick moisture away from the food product and into the absorbing layer 12. Preferably, membrane 14 is made from a polyethylene film. The film is punched to provide perforations to allow fluid to pass downward from the food contact surface into the absorbing layer 12. One preferred polyethylene film has a basis weight of 23 grams/m^2. However, with reference to Fig. 5, the perforations are formed such that the upper diameter 18 of a given perforation, facing food contact surface 16, is larger than the lower diameter 20. For this reason, absorbed fluid is less likely to migrate, through capillary action or otherwise, from absorbing layer 12 to the food contact surface of membrane 14. This feature has the added benefit of minimizing the migration of biocide or SAP from absorbing layer 12 to the food contact surface 16. At the same time, because membrane 14 is preferably made from a hydrophobic material such a polyethylene, it does not actively draw fluid from the food product as might occur if the food product directly contacted absorbing layer 12.

In the embodiment shown in Fig. 4, the laminate of the present invention includes structural layer 10 directly laminated to absorbing layer 12. In the embodiment of

Fig. 1, structural layer 10 is directly laminated to absorbing layer 12, and membrane 14 is provided on absorbing layer 12. In the embodiment of Fig. 2 structural layer 10 is laminated to absorbing layer 12 by adhesive 11, and membrane 14 is provided on absorbing layer 12 Adhesive 11 may be any adhesive compatible with the two layers, and acceptable for use in a food packaging environment. Examples of such adhesives include ethylene vinyl acetate (EVA); acrylics, urethanes, polyamides, polyesters, polyamides, etc. An example of a suitable EVA adhesive is Airflex 460, available from Air Products.

The finished laminate should be constructed from materials compatible with commercial and residential microwaves and freezers.

Construction of the laminate of the present invention may be accomplished in several ways. The absorbing material 12 may be formed, for example by casting to the desired gauge using standard foaming equipment. The foam may be cast directly onto the structural layer 10 or cast separately for lamination to structural layer 10 in a separate step.

After the laminate has been constructed, a tray may be shaped by thermoforming, vacuum forming, stamping, or other techniques known in the art.

Membrane 14 may be adhered to the upper surface of absorbing layer 12 by thermobonding, ultrasonic welding of the membrane to the lip 24 of tray 22. The membrane may be adhered to absorbing layer 12 or structural layer 10. In a preferred embodiment, membrane 14 is secured to the tray only at lip 24 and the membrane thus "floats" on the surface of the absorbing material 12 in the body of the tray.

In a preferred embodiment, a semi-rigid hydrophilic polyurethane foam is laminated to a polystyrene structural layer.

In another embodiment, a laminate may be constructed according to the present invention for use in conjunction with an existing food tray or receptacle. Such a laminate is cut to a desired shape to fit within the food receiving area of the tray. In this embodiment support layer 10 does not have to provide as much support as it does when the laminate is use to form the tray itself. Accordingly layer 10 may be of a thin moisture barrier film such as polyethylene. Alternatively, layer 10 may be eliminated entirely.

WHAT IS CLAIMED IS:

1. A receptacle for containing food products which tend to exude liquids, comprising a laminate, said laminate comprising a structural support layer having a top surface and a bottom surface, and a liquid absorbing layer with a top surface and a bottom surface, wherein said bottom surface of said liquid absorbing layer is laminated to said top surface of said support layer.

2. The receptacle of claim 1 wherein said laminate further comprises a hydrophobic membrane disposed above said top surface of said absorbing layer, wherein said hydrophobic membrane includes perforations, said perforations having an upper and a lower diameter.

3. The receptacle of claim 1 wherein said support layer is a thermoplastic material selected from the group consisting of polystyrene, polyethylene, polypropylene, and polyvinyl chloride cellular materials.

4. The receptacle of claim 1 wherein said absorbing layer is polyurethane foam.

5. The receptacle of claim 4, wherein said absorbing layer further comprises a superabsorbent polymer.

6. The receptacle of claim 4, wherein said absorbing layer further comprises a biocide.

7. The receptacle of claim 5, wherein said superabsorbent polymer comprises from 0 to 10 weight percent of said absorbing layer.

8. The receptacle of claim 7, wherein said biocide comprises from 0 to 1 weight percent of said absorbing layer.

9. The receptacle of claim 2, wherein said hydrophobic membrane is polyethylene.

10. The receptacle of claim 9, wherein said upper diameter of said perforations of said hydrophobic membrane is larger than said lower diameter of said perforations.

11. The receptacle of claim 2, wherein said bottom surface of said hydrophobic membrane is attached to said top surface of said absorbent layer.

12. The receptacle of claim 2, wherein said receptacle comprises a lip, and wherein said hydrophobic membrane is attached only to said lip, wherein said bottom surface of said hydrophobic membrane is disposed upon, but is not attached to, said upper surface of said absorbing layer.

13. A method for producing a receptacle for containing food products which tend to exude liquids, comprising the steps of:

providing a structural support layer with a top surface and a bottom surface, wherein said structural support layer is comprised of a thermoplastic material;

providing an absorbing layer with a top surface and a bottom surface; and

attaching said bottom surface of said absorbing layer to said top surface of said structural support layer to form a laminate.

14. The method of claim 13, further comprising providing a food contact membrane with a top surface and a bottom surface and attaching said bottom surface of said food contact membrane with said top surface of said absorbing layer.

15. The method of claim 13 wherein said absorbing layer is a polyurethane foam produced by reacting one or more members selected from the group consisting of polyether polyols and polyester polyols with a polyisocyanate.

16. The method of claim 15 wherein said polyisocyanate is selected from the group consisting of diisocyanatophenyl methane or toluene diisocyanate.

17. A method for absorbing fluid exuded from a food product placed within a food receptacle, comprising the steps of:

providing a food receptacle which comprises a structural support layer having a top surface and a bottom surface, wherein said structural support layer comprises a thermoplastic material, and a liquid absorbing layer with a top surface and a bottom surface, wherein said bottom surface of said liquid absorbing layer is laminated to said top surface of said support layer; and

placing a food product which is disposed to exude liquids above the top surface of said absorbing layer.

18. The method of claim 17, wherein said food receptacle further comprises a food contact membrane with a top surface and a bottom surface, wherein said bottom surface of said food contact membrane is disposed above said top surface of said absorbing layer, and wherein said food product is disposed upon said food contact membrane.

FIG. 1

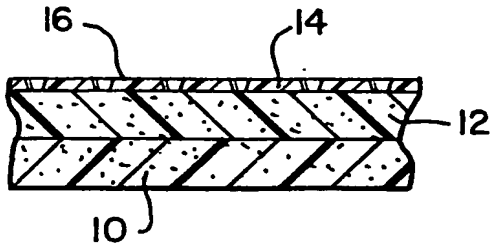


FIG. 2

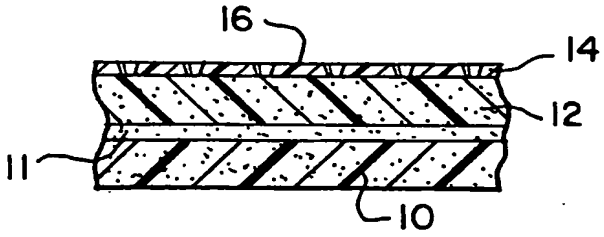
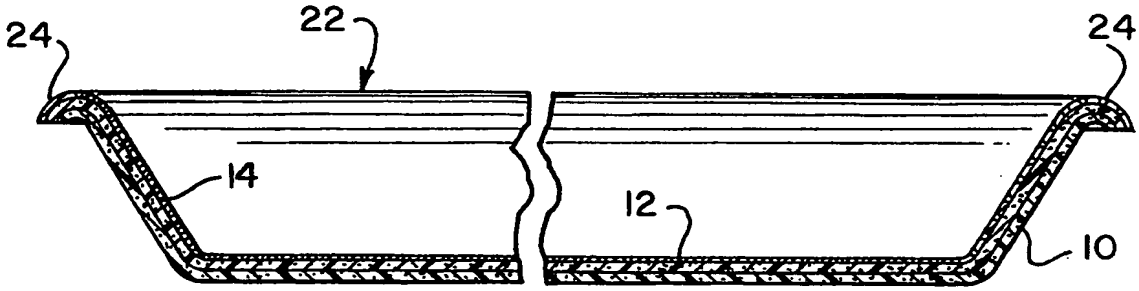


FIG. 3



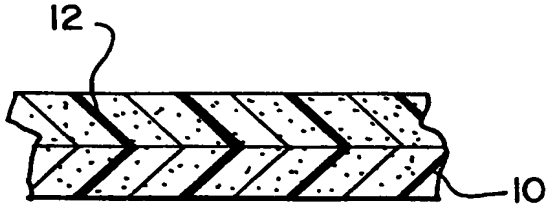
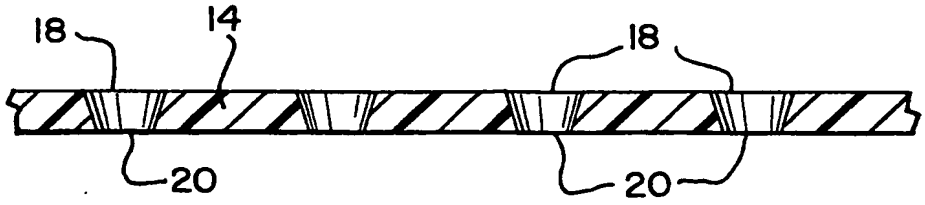


FIG. 4

FIG. 5



INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/27177

A. CLASSIFICATION OF SUBJECT MATTER
IPC(6) :B32B 27/00
US CL :428/36.5
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 428/36.5, 71, 131, 138, 319.9, 424.2, 424,6, 424.8; 220/465; 206/524.2

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4,036,675 A (AMBERG et al) 19 July 1977, col. 3, lines 15-25.	1-18
X	US 4,237,171 A (LAAGE et al) 02 December 1980, col. 3, lines 11-45.	1-18
Y	US 4,828,891 A (LUSTIG et al) 09 May 1989, col. 5, lines 5-45.	1-12

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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